A mechanical model of an STS station for the study of cable routing

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Mechanical aspects of STS construction

The silicon tracking detector STS for the CBM experiment at FAIR poses an engineering challenge due to its compactness and requirements concerning signal density, signal-to-noise ratio, and efficiency. The restricted height of the magnet yoke opening together with the number of readout channels and requirement to geometrical acceptance, operating temperature and mass budget [1] leave very little room for the readout and data transfer electronics and needed power conversion electronics inside of the STS container (Fig. 1).

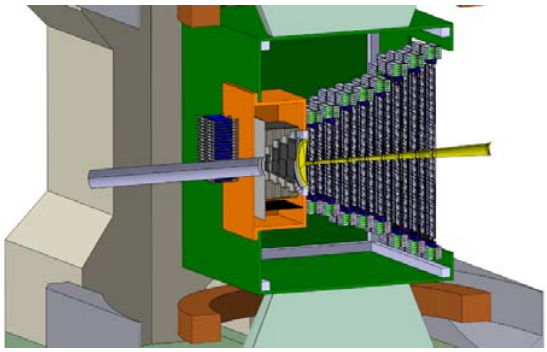

Figure 1: STS in the yoke of the dipole magnet.

Under such restrictive conditions it is very critical to find proper mechanical, electronic and electrical solutions/components like very compact circuits of highest efficiency, fine-pitch flexible cables for analog and digital signals, corresponding connectors or bonding methods as well as thin and flexible cables of adequate lead cross section for power supply. Last but not least the positioning of the components and shape of the cooling bodies together with the topology of cable routing paths have to be defined.

Real-size model of the STS

In order to verify many of the posed questions and corresponding tentative answers a three-dimensional model of one STS station has been constructed. Axial symmetry of the STS allows to concentrate on one quarter of the most crowded station 7 of the STS (Fig. 2). The model has been constructed according to mechanical design drawings and fulfills requirements like parts' dimensions, cable thickness and flexibility. This mechanical mockup allows confirming methods elaborated for the handling of STS stations and its subsystems as well.

Figure 2: Mechanical model of one STS station.

References

[1] J. Heuser et al., Technical Design Report for the CBM Silicon Tracking System, GSI Report 2013-4, http://repository.gsi.de/record/54798